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RESOURCE MANAGEMENT REPORT

ONTARIO

DEPARTMENT OF LANDS AND FORESTS

Hon. A. Kelso Roberts, Q.C.
Minister

F. A. MacDougall
Deputy Minister

No. 82

July, 1965

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Fish & Wildlife Branch

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CONTROL OF WATER LEVELS IN BEAVER PONDS CAUSING FLOODING PROBLEMS TO PUBLIC UTILITIES

by
R. G. Boothby
Wildlife Management Officer - Swastika Forest District

Abstract

The installation of a wood-constructed box-type pipe with slatted bottom proved an economical method of controlling high water levels caused by a beaver colony along a highway. Instructions and diagrams for the construction of this control device are given. The installation of this type of control in beaver populated trout streams should prove beneficial in preventing stagnation in the ponds and also permit water flow in the downstream sections during critical dry periods.

The flooding of provincial highways and municipal roads continues to increase, and requests for assistance or guidance has become a time-consuming and fruitless task of the conservation officer in the District.

Intensive trapping during both the open and closed seasons, as well as dynamiting the beaver dams, relieved the flooding conditions for only a short period of time, and a more permanent method of water control became desirable.

Two twelve-foot sections of wooden pipe ten inches square were constructed of good quality 1" x 10" spruce lumber. The entire length of the bottom sides of both sections, with the exception of a solid piece 24" long on the downstream end of the first section, was made of two inch by one inch cross slats spaced three-quarters of an inch apart. The top, two sides and cross slats of the pipe were screw nailed together to ensure greater strength; the upstream end of the second section was boarded over to prevent the beaver from plugging the pipe (see Diagram #1).

In discussions concerning the construction of the pipes, it was decided to install a baffle plate in the downstream section which could be completely closed or raised to four different positions to control water flow (see Diagram #2).

In order to join the two sections together, eight pieces of 1" x 4" x 24" lumber are nailed equal distances from the centre joint on the four corners of the pipe (see Diagrams #1 and #3). Although the control pipe was designed for the installation on the beaver dam (see Diagram #4), the investigation of flooding along the McGarry Municipality Road revealed that beaver plugging of the thirty inch steel culvert contributed more to the condition than the water level in the pond.

On August 13, 1964, the two pipes were placed side by side in approximately fifteen inches of water, with the open ends placed two feet inside the culvert. The upstream ends of the pipes were placed on flat rocks three feet above the stream bottom and weighted on the tops by heavy boulders to prevent the pipes from floating (see Diagrams #5 and #6). Once in position, a large screen of heavy galvanized iron was placed upright on top of the pipes, and against the opening of the culvert to prevent any further plugging of the culvert by branches, etc. Stones were used to close the openings between the sides of the pipes and the culvert (see Diagram #7).

Subsequent visits to the site revealed that:

On August 15, the water level had lowered approximately one inch. There was a full water flow through the pipes and no sign of beaver activity.

On August 17, the water level was lowered three inches, with a full flow of water through the pipes. There were fresh signs of beaver feeding on shore near the culvert.

On August 20, the water level had dropped another two inches and the tops of the control pipes were above water level. There was a good flow of water through the pipes and there were more signs of beaver activity.

On August 25, the water level was four inches below the tops of the pipes, the water flow was good and the large screen was partially blocked. Some debris was on top and along the sides of the pipe.

On August 30, the water level had risen approximately three inches due to heavy rains. There was a full flow of water through the pipes and a great deal of debris along the sides. The large screen was nearly blocked and the bottom sections of the pipes were free of debris.

On September 17, the water level had again dropped approximately three inches, and there was a good flow of water through the pipes. There were large quantities of debris on top and along the sides of the pipes, but the bottom was free of any obstruction.

On October 5, the water level was two inches below that of September 17, with still a good flow through the pipes. The large screen was completely plugged, and there was some debris on the bottom of the pipes with no apparent effect on the flow of water.

On October 5, the pipes were removed to allow the registered trapper a better opportunity to harvest the beaver under normal conditions.

Conclusion

The problem of flooding was alleviated for the entire installation period (August 13 to October 5) without any complaints from the municipal authorities.

The cost of construction (approximately $6.00 per 12' section minus labour) and several trips by Department personnel to check on the results of the installation proved economical and time-saving to all concerned, as this specific area has caused considerable loss of time and effort in previous years.

Recommendation

In ponds where the water is fairly deep, and it is not possible to place the upstream ends of the pipe or pipes on flat rocks, it is suggested that steel fence stakes be driven into the pond bottom at the upstream ends of the pipe or pipes and at the coupling or joint. The pipe could then be securely wired to each stake at the required height. Instead of using stones to close the openings between the sides of the pipes and the culvert, it is suggested that smaller pieces of screening be used. This method would not only be time-saving, but in some cases stones may not be available.

Acknowledgments

The idea for this control pipe originated from an article by H. A. Laramie, Jr., "A Device for Control of Problem Beavers" which appeared in the Journal of Wildlife Management, Vol. 27, No. 3, July, 1963. pp. 471-476.

I would like to thank Fish & Wildlife Supervisor D. G. Waldriff, Carpenter Matti Norppa, and the staff of the Larder Lake Headquarters for their assistance in making this project possible.

DIAGRAM #1 - WOODEN CONTROL PIPE

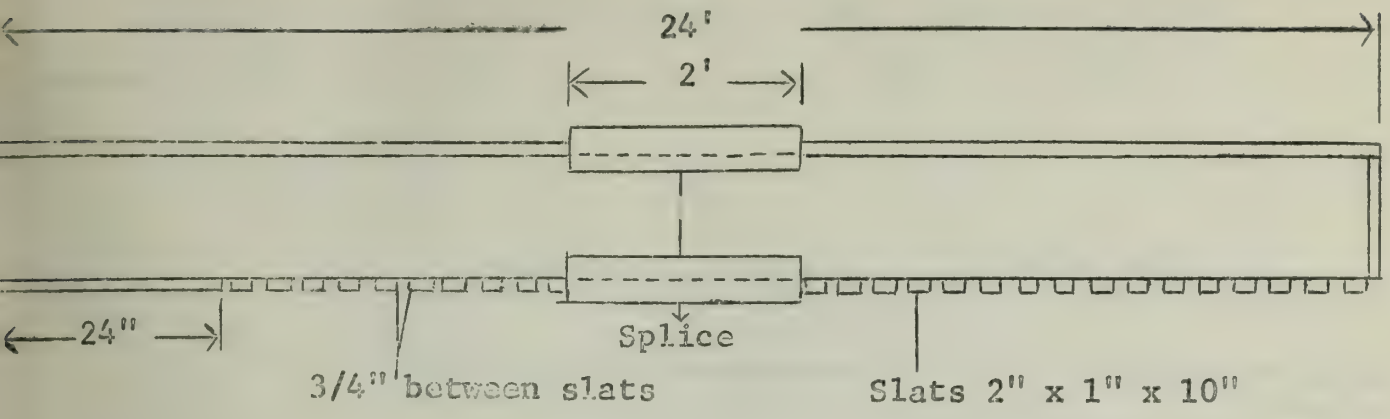


DIAGRAM #2 - BAFFLE CONTROL PLATE

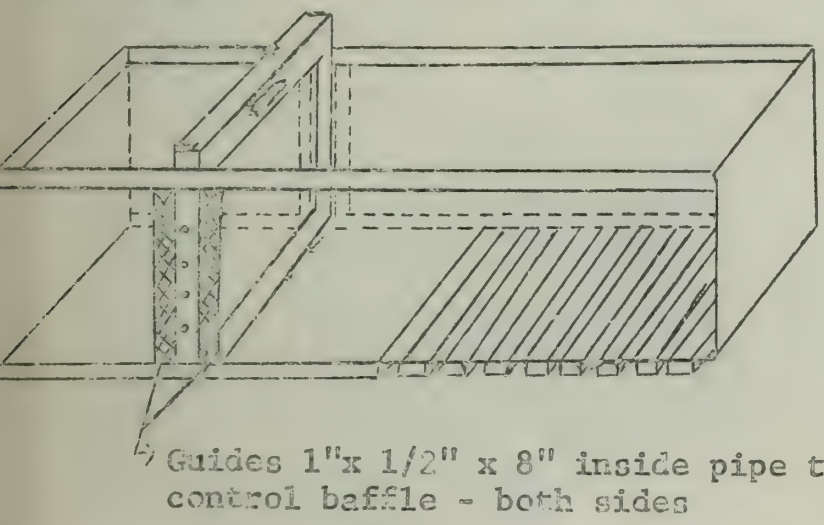


DIAGRAM #3 - SECTION THROUGH PIPE AT SPLICE

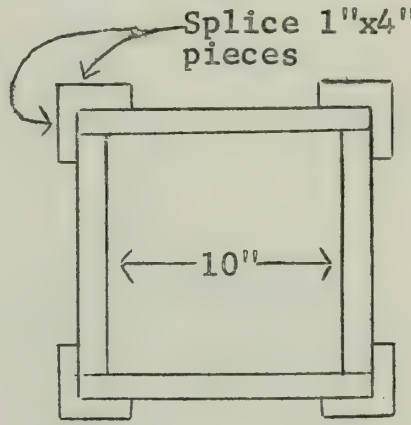


DIAGRAM #4 - CONTROL PIPE PLACED ON BEAVER DAM

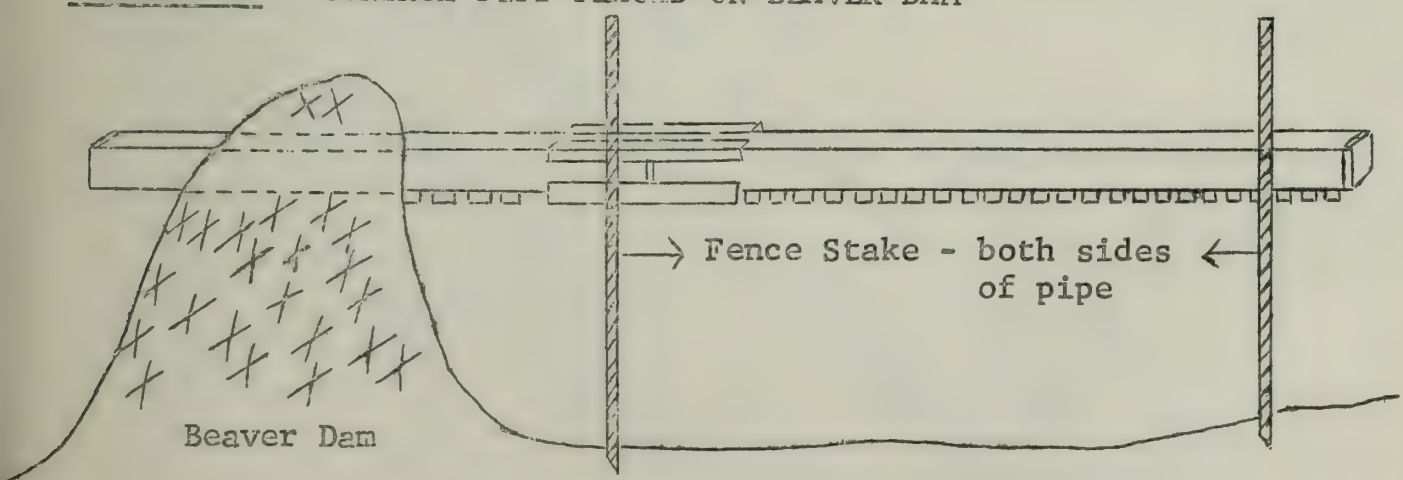


DIAGRAM # 5 - SIDE VIEW OF CONTROL PIPES PLACED IN CULVERT

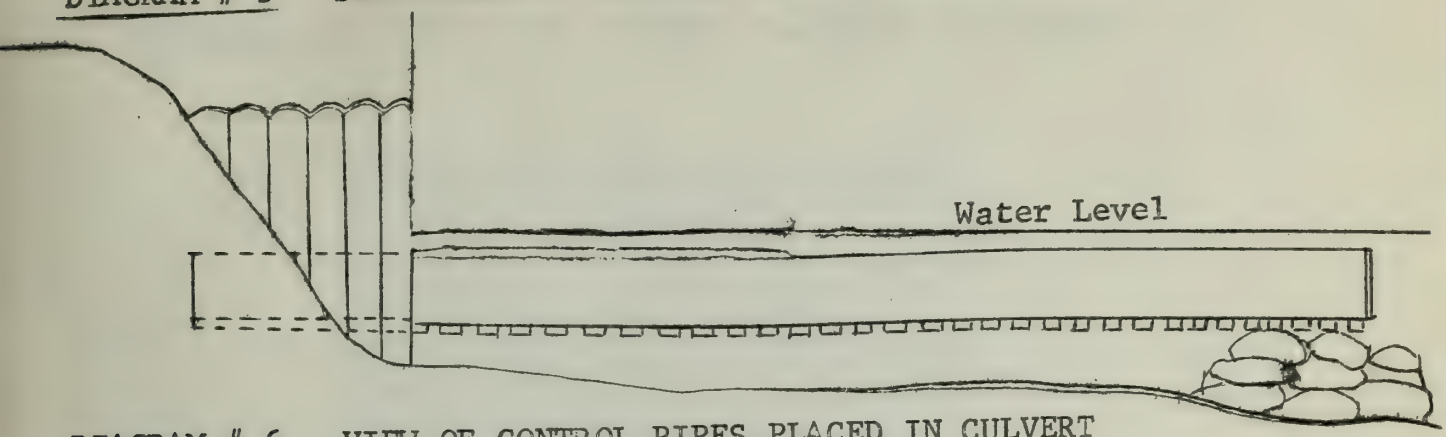
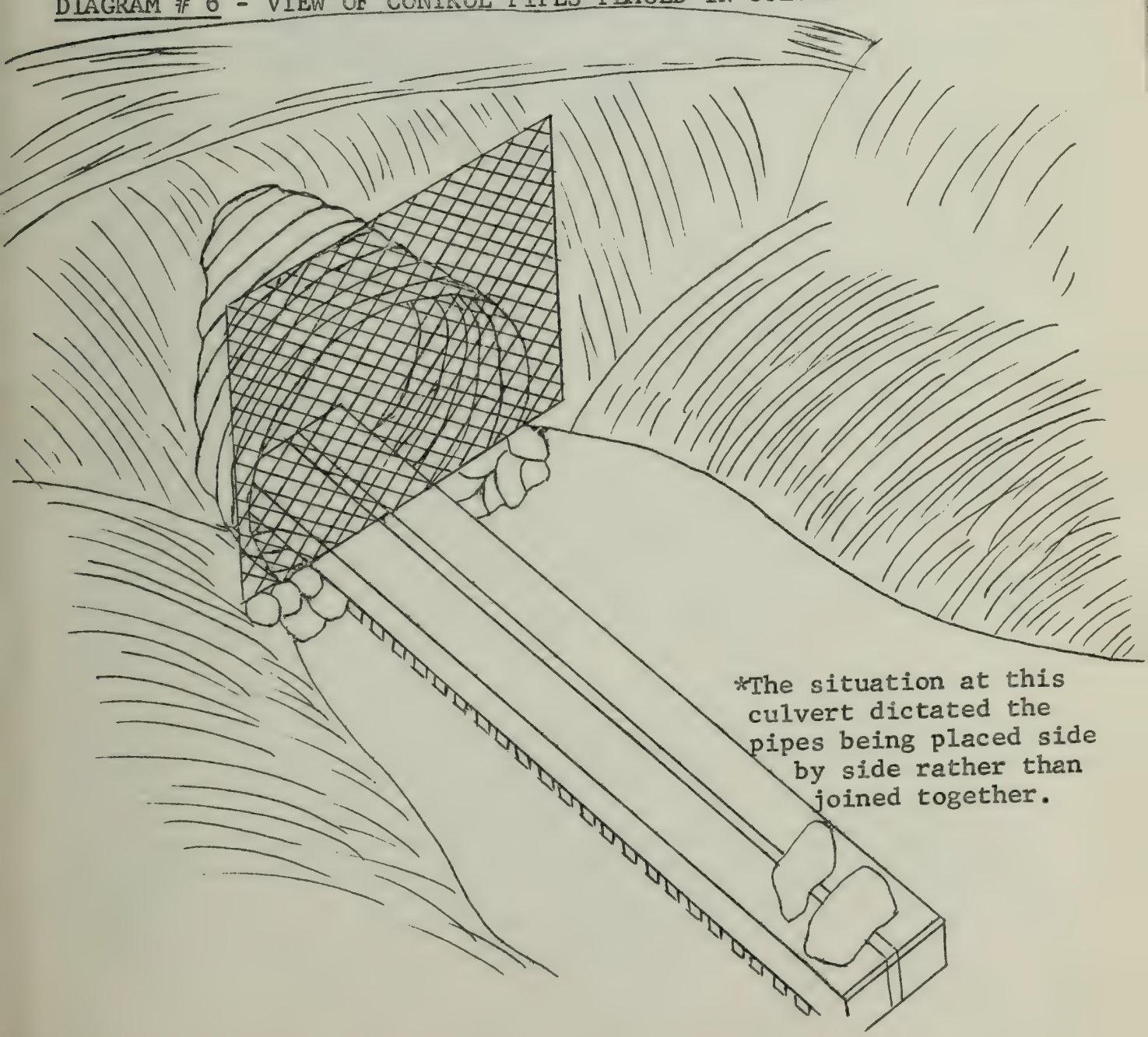
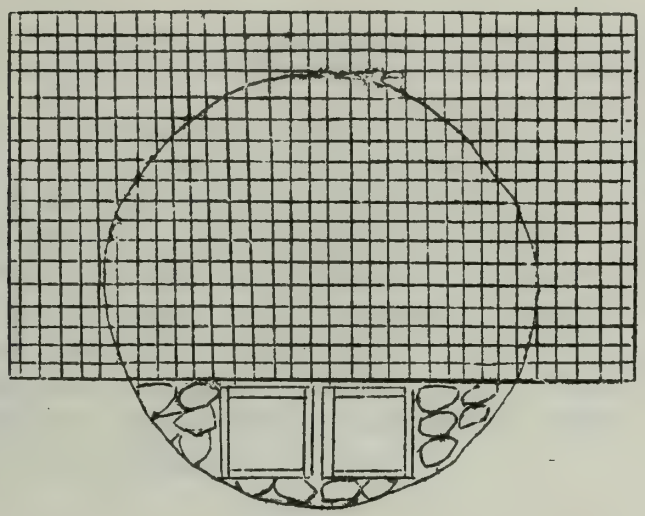


DIAGRAM # 6 - VIEW OF CONTROL PIPES PLACED IN CULVERT



*The situation at this culvert dictated the pipes being placed side by side rather than joined together.

DIAGRAM # 7 - END VIEW SHOWING PLACEMENT OF SCREEN



LINDSAY DISTRICT WATERFOWL HUNTING IN 1964

by
E. T. Cox, Biologist

Abstract

Field checks of hunters showed figures of 1.6, 1.5, 1.1, 0.7, and 0.25 waterfowl bagged per hunter for the periods of opening day, the rest of September, October, November, and December, respectively. The 563 duck wing specimens collected were mainly black ducks (109), mallards (103), green-winged teal (102), blue-winged teal (80), and wood duck (60). Decidedly higher immature to adult ratios (as compared with 1963) were found for black ducks, mallards, both species of teal, and wood ducks.

Introduction

Common names for species are used after Peterson, 1963. Background information is available in the previous report (Cox, 1965). The 1964 duck hunting season opened September 26 and closed on December 15. Most small bodies of water were ice covered by early November.

Methods

Hunting data were obtained by conservation officers and Parks personnel in the field. This information was recorded by Department staff on the "Waterfowl Checking Station Card" (Form H-35) and by hunters at Darlington Provincial Park on a special daily report form. Results are presented by month and by county in Table I of the appendix.

Most wing specimens were collected by conservation officers in the field. Specimens were separated, one species at a time, as to age and sex by J. A. Robertson, W. R. Wyett, and the author (all District staff). Preliminary keys prepared by Carney and Geis were used with some reference to Carney and Geis, 1960. Approximately 10 man-days of work were required to examine the 563 specimens which are summed by species and county in Table II (appendix). Sex and age figures are given in Table III (appendix), for species having a sample of 10 or more specimens.

Duck Hunting

There was a substantial increase in the number of hunters checked on opening day and during October and November 1964 as compared with the same periods in 1963. The number of birds per hunter averaged higher on opening day and in October but declined in November.

Wing Specimens

The increase of 251 wing specimens over 1963 reflects both better hunting and a greater effort to obtain wings.

Black Ducks - 109 specimens, collected between opening day and October 17. Most of these wings came from Haliburton and Peterborough Counties. The ratio of immatures to adults in 1964 (9.8:1) was more than double the 4.7:1 in 1963. September specimens showed six adults and 85 immatures. October specimens showed two adults and 14 immatures. The Haliburton sample had three adults and 36 immatures while the Peterborough sample had two adults and 38 immatures. Samples from Brighton, Dysart and Galway Townships showed, respectively, one adult and 13 immatures, 15 immatures, and 13 immatures.

Mallards - 103 specimens, taken between September 26 and October 17, mostly from Northumberland and Peterborough Counties. The ratio of immatures to adults (23:1) was approximately three times the 8.2:1 found in 1963. In September, two adult females and 74 immatures were taken as compared to two adult females and 20 immatures taken in October. The Rice Lake sample had one adult female and 13 immatures. Brighton and Harvey Townships samples had, respectively, 14 and 16 immatures.

Green-winged Teal - 102 specimens, 90 from Northumberland County and 86 taken on opening day. The number of immatures per adult in 1964 (8.7) is somewhat higher than the 5.8 taken in 1963. On opening day five adult males, five adult females, 35 immature males, 20 immature females, seven unsexable immatures and two unusable specimens were taken in Brighton Township (Presqu'ile Provincial Park).

Blue-winged Teal - 80 specimens, 77 taken on opening day, most from Northumberland County. The 1964 immature to adult ratio of 23:1 is about three times the 7.9:1 found in 1963. The opening day sample at Brighton yielded one adult male, 16 immature males, 26 immature females and one unusable specimen. The Rice Lake sample of the same date had five males and 12 females, all immature, besides two unusable specimens.

Wood Ducks - 60 specimens. The ratio of 3.8 immature per adult found in 1964 is twice that found in 1963 but not the highest ratio recorded.

1961 - 5.3 young per adult
1962 - 1.5 young per adult
1963 - 1.9 young per adult
1964 - 3.8 young per adult

Ring-necked Ducks - 25 specimens, mostly from Haliburton County.

Comments

There are plans to obtain a much more complete sample of hunting and wing specimens from the Provincial Parks in this District during 1965.

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Carney, S. and A. Geis, 1960. Mallard Age and Sex Determination From Wings. J. Wildl. Mgt., 24(4): 372-381.

Cox, E. T., 1965. Duck Hunting in the Lindsay District 1963. Resource Management Report, 79:28-35.

Cringan, A., 1961. Duck Wing Collection, Southern Ontario, 1961. Unpublished.

Peterson, R. T., 1963. A Field Guide to the Birds. Houghton Mifflin Company, Boston.

TABLE I - Waterfowl Hunting Effort and Bag - 1964, Lindsay District

Opening Day	Counties					Totals
	Durham	Hali.	North.	Peter	Vict.	
Hunters	30	71	100	64	111	376
Hunter-hours	-	266	608	200	405	-
Dogs	-	12	3	8	5	28
Cripples lost	-	16	25	20	45	106
Black ducks	-	28	22	31	27	108
Blue-winged teal	-	0	87	1	15	103
Green-winged teal	-	0	80	0	23	103
Mallards	-	10	27	36	28	101
Wood ducks	-	20	11	29	11	71
Unidentified	51	0	0	0	1	52
Lesser scaup ducks	-	8	5	5	3	21
Hooded mergansers	-	6	0	4	2	12
Other species	-	5	30	-	7	42
Total ducks	51	77	262	106	117	613
Ducks per hunter	1.7	1.08	2.6	1.7	1.05	1.63
Hours per duck	-	3.5	2.3	1.9	3.5	-
September After Opening Day						
Hunters	35	5	-	1	-	41
Hunter-hours	-	8	-	2	-	-
Dogs	-	2	-	1	-	3
Cripples lost	3	-	-	-	-	3
Total ducks	60	2	-	1	-	63
Ducks per hunter	1.7	0.4	-	1.0	-	1.5
Hours per duck	-	4.0	-	0.5	-	-
October						
Hunters	200	34	3	40	9	286
Hunter-hours	-	59	13	100	34	-
Dogs	-	3	0	8	2	13
Cripples lost	24	12	1	11	3	51
Unidentified	204	0	0	2	0	206
Black ducks	-	7	1	15	5	28
Mallards	-	1	0	18	6	25
Wood ducks	-	1	0	11	5	17
Geese	3	0	3	1	4	11
Mergansers	4	0	0	6	0	10
Other species	-	8	4	11	7	30
Total waterfowl	211	17	8	64	27	327
Birds per hunter	1.1	0.5	2.7	1.6	3.0	1.1
Hours per bird	-	3.5	1.6	1.6	1.3	-

NOTE: Hali. - Haliburton County Peter. - Peterborough County
North.- Northumberland County Vict. - Victoria County

Continued.....

Table I -- Continued

November	Counties					Totals
	Durham	Hali.	North.	Peter.	Vict.	
Hunters	135	8	-	3	4	150
Hunter-hours	-	13	-	4	20	-
Dogs	-	0	-	0	2	2
Cripples lost	16	1	-	1	4	22
Unidentified	64	0	-	0	0	64
Mergansers	7	8	-	0	1	16
Greater scaup ducks	-	0	-	0	13	13
Geese	5	0	-	0	0	5
Other duck species	-	0	-	6	4	10
Total waterfowl	76	8	-	6	18	108
Birds per hunter	-	1.0	-	2.0	4.5	0.72
Hours per duck	-	1.6	-	0.7	1.1	-
December						
Hunters	12	-	-	-	-	12
Cripples lost	1	-	-	-	-	1
Total ducks	3	-	-	-	-	3
Ducks per hunter	0.25	-	-	-	-	0.25

Lindsay District

TABLE II - Source and Species Composition of 1964 Duck Wing Collection

Species	Number of Specimens by County					Date Collected
	Hali.	North.	Peter.	Vict.	Total	
Black duck	40	20	40	7	109*	Sept.26-Oct.17
Mallard	18	32	48	5	103	Sept.26-Oct.17
Green-winged teal	1	90	4	7	102	Sept.26-Nov.26
Blue-winged teal	3	58	2	17	80	Sept.26-Oct.10
Wood duck	19	8	19	14	60	Sept.26-Oct.14
Ring-necked duck	15	2	4	4	25	Sept.26-Oct.17
Hooded merganser	13	-	2	1	16	Sept.26-Nov.17
Pintail	-	13	-	-	13	Sept.26-Oct. 7
Lesser scaup duck	1	12	-	-	13	Sept.26-Oct. 8
Greater scaup duck	-	6	-	4	10	Sept.26-Oct.14
Baldpate	-	7	-	1	8	Sept.26 &Oct.17
White-winged scoter	-	6	-	-	6	Oct. 6 & 8
Black x mallard hybrids	-	3	-	1	4	Sept.26
Redhead	-	4	-	-	4	Sept.26
Oldsquaw	-	3	-	-	3	Sept.26
Shoveler	-	3	-	-	3	Sept.26
Bufflehead	-	1	-	-	1	Oct.
Surf scoter	-	1	-	-	1	Oct.14
Gadwall	-	1	-	-	1	Sept.26
American goldeneye	-	1	-	-	1	Sept.26
	110	271	119	61	563*	

* includes 2 specimens with no county designation

Lindsay District

TABLE III - Sex and Age Ratios From 1964 Duck Wing Collection

Species	Number of Specimens						Ratios	
	Adults			Immatures			Immatures Per Adult Female	Per Adult
	♂	♀	Total	♂	♀	Total		
Black duck	9	1	10	-	-	98	98.	9.8
Mallard	0	4	4	45	46	94*	23.	23.
Green-winged teal	5	5	10	50	29	87*	17.	8.7
Blue-winged teal	3	0	3	27	43	70	-	23.
Wood duck	9	3	12	22	24	46	15.	3.8
Ring-necked duck	0	2	2	-	-	21	10.	10.
Hooded merganser	2	0	2	-	-	14	-	7.0
Pintail		1	1	6	6	12	12.	12.
Lesser scaup duck	3	2	5	4	3	7	3.5	1.4
Greater scaup duck	2	2	4	5	1	6	3.0	1.5

* unsexed immatures included

GROUSE REPORT, 1964, NORTH BAY DISTRICT

by
R. G. Bailey

Abstract

This report covers such phases of the 1964 North Bay grouse study as brood counts, hunter success, temporal distribution of the kill and sex and age ratios. Grouse hunting in 1964 compared favourably to the previous year. Statistics revealed that hunter success on foot was 0.95 birds per hunter; from cars - 0.94 birds per hunter; from deer hunter camps - 3.71 birds per hunter.

Statistics revealed that grouse hunting was comparable to 1963. Although it appears that the grouse population is not at its peak, especially in areas of easy access, deer hunt camp secretaries who submitted returns on grouse hunting during the deer season recorded a very high kill. An average of 3.71 birds per hunter was achieved which is quite exceptional. This new information certainly gives us insight as to the grouse population in areas of relative difficult access.

Brood Counts

Brood counts were recorded from June until September by conservation officers and other Departmental personnel who were in the field at that time (See Map #1 and Table I).

A total of 126 broods were observed containing 548 chicks. This gives an average of 4.35 chicks per brood. This index has been used for several years in order to help us predict how the hunt will be. The following table illustrates the brood counts for the last four years.

TABLE II - Brood Counts

Year	Number of Broods Observed	Average Brood Count
1961	36	6.05 chicks per brood
1962	109	5.20 " " "
1963	118	4.85 " " "
1964	126	4.35 " " "

(See Map for brood distribution in 1964)

TABLE I

Brood Counts by Month (1964)

Month	Broods	Chicks	Chicks per Brood
June	27	139	5.15
July	56	236	4.21
August	33	142	4.30
September	10	31	3.10
Total	126	548	Average 4.35

Certainly there is a downward trend in the number of chicks per brood, however this may be due to a change in the method of counting chicks. Previously an estimate of the number of chicks missed was included in the calculations while now only the chicks actually observed are recorded. Also the number of broods observed per year has steadily increased thus giving us a more realistic index for 1964. The same methods employed in 1964 will be applied in 1965.

Hunter Success

Grouse hunting in the North Bay District this year was comparable to 1963. There appears to be a very slight improvement in hunter success, particularly for those hunting from a car. Table III will illustrate this year's hunt and Table IV the past three years' hunts which allows one to compare and contrast the fluctuating grouse population.

TABLE III - Hunter Success

Hunting on Foot - Form H-50

No. of Hunters = 178
No. of Birds Shot = 169
No. of Birds Flushed = 315
No. of Man-hours = 541

Hunter Success = 0.95 Birds per Hunter
Hunting Effort = 3.20 Man-hours per Bird
Man-hours per Bird Flushed = 1.72 Hours
Birds Shot per 100 Man-hours = 31.23
Birds Flushed per 100 Man-hours = 58.22

Table III Cont'd

Road Hunting From Automobile - Form H-50

No. of Hunters = 188
No. of Birds Shot = 177
No. of Birds Observed = 322
No. of Miles Travelled = 3082

Hunter Success = 0.94 Birds per Hunter
Miles Driven per Bird Shot = 17.41 Mi.
Miles " " " Observed=9.57 Mi.
Birds Shot per 100 Miles = 5.74
Birds Observed per 100 Miles = 10.45

Hunting with Dogs - Form H-50

No. of Hunters = 18
No. of Birds Shot = 16
No. of Birds Flushed = 33
No. of Man-hours = 59

Hunter Success = 0.89 Birds per Hunter
Hunting Effort = 3.28 Man-hours per Bird
Man-hours per Bird Flushed = 1.06 Hours
Birds Shot per 100 Hours = 27.11
Birds Flushed per 100 Hours = 55.93

Deer Camp Grouse Reports

No. of Hunters = 127
No. of Birds Shot = 471
No. of Grouse Flushed = 578
No. of Man-hours = 950

Hunter Success = 3.71 Birds per Hunter
Hunting Effort = 2.02 Man-hours per Bird
Man-hours per Bird Flushed = 1.64 Hours
Birds Shot per 100 Hours = 49.57
Birds Flushed per 100 Hours = 60.84

TABLE IV - Hunt Success 1961 to 1964

Foot Hunters

Year	Number of Hunters	Brood Count	Birds/Hunter	Man-hours/ Bird Shot	Man-hours/ Bird Flushed
1961	65	6.05	1.12	2.60	1.53
1962	173	5.20	1.50	1.90	1.00
1963	82	4.85	0.94	3.40	1.40
1964	178	4.35	0.95	3.20	1.72

Car Hunters

Year	Number of Hunters	Birds/Hunter	Miles/Bird Shot	Miles/Bird Observed
1961	27	0.59	27.4	16.2
1962	84	0.90	18.8	8.5
1963	88	0.73	24.2	14.6
1964	188	0.94	17.4	9.6

Hunt success data for 1964 will be more reliable than the past four or five years as more hunters were contacted. There is still room for improvement as far as sample size is concerned and every effort will be exerted to increase the number of returns next year.

It appears as though the grouse population is beginning to recover to former numbers. The trough of the cycle apparently has been reached and we are now heading up the slope to the peak. If this is the case we can expect more successful grouse hunters in the years to come until the peak is reached once more.

The information provided by grouse hunters in the deer camps is a welcome new addition to the grouse report. It reveals that areas of relatively difficult access which have been subjected to a small amount of hunt pressure will produce excellent hunting. That is, if one considers 3.71 grouse per hunter excellent. This information will be gathered every year from now on and will be included in future reports.

An added note of interest was the fact that 14 spruce grouse were reported shot in the District. The location of these kills is recorded on the distribution map (See Map #2).

Sex Ratios and Age Ratios

A total of 738 ruffed grouse wings and tails were collected by the Fish and Wildlife Staff. Of these, 32 were questionable as to sex and age; the remaining 706 grouse wings and tails were sexed and aged.

The 14 spruce grouse wings and tails were also collected, however, they were not sexed or aged.

With this data it can be satisfactorily assumed that reliable information concerning sex and age ratios was determined. Table IV indicates the sexes and ages according to patrol areas while Table V illustrates the over-all sex and age ratios.

TABLE V - Sex and Age Data

Patrol #	Adult ♂	Adult ♀	Juvenile ♂	Juvenile ♀	?
1	15	8	20	14	4
2	17	15	13	11	2
3	14	9	32	26	4
4	3	4	7	3	-
5	29	17	35	26	7
6	22	5	49	44	-
7	7	7	18	7	1
8	36	36	79	69	14
9	-	3	4	2	-
Office					
Totals	143	104	257	202	32

TABLE VI - Sex and Age Ratios

Sex Ratios 1964

Adults (M:F)= 1:0.73 or 143:104
Juveniles (M:F)= 1:0.79 or 257:202

Age Ratios 1964

AF:J = 1:4.41 or 104:459
A:J - 1:1.86 or 247:459

Age Ratios of Grouse

Year	Number of Birds Considered	AF:J	A:J
1961	573	1:5.50	1:2.45
1962	184	1:5.80	1:2.68
1963	413	1:3.90	1:1.99
1964	706	1:4.41	1:1.86

Sex Ratios of Grouse

AM:AF	JM:JF
1:0.78	1:1.16
1:0.85	1:0.81
1:0.88	1:1.48
1:0.73	1:0.79

Key - A = Adults J = Juveniles M = Males and F = Females

Sex and age ratios are similar to other years with the exception of the sex ratio of juvenile males and females. This year a ratio in favour of the juvenile male birds was the case as in 1962. One would expect this as every year the adult males have dominated the adult females. It is believed that the previous dominance of juvenile females resulted from incorrect aging techniques. It was found that there was a tendency on the part of some agers to call juvenile males, adult females or juvenile females. As a result juvenile males were "short changed" so to speak and the resulting ratios not as exact as should be expected. In the past sexing has been accomplished by visual inspection of the presence of

a terminal band and little, if any, reference to measurements of the central tail feathers. This problem has been corrected and all agers will be re-instructed in the fall of 1965.

The wings and tails have been collected independently from the hunter success data in past years. It is hoped that this will be resolved and a correlation between the two will be possible.

Temporal Distribution

Temporal distribution of kill has been prepared in graph form (See Figure 1).

It appears as though the greatest hunting pressure is exerted between September 21 and October 18. One must be careful with this conclusion as the conservation officers collecting information are usually most active during this time. Although this may be so, it is felt that this is the time when grouse hunters exert the greatest pressure on the grouse population. A possible exception is during the two week deer season. Future research should indicate the validity of this conclusion.

Kill Distribution

The distribution of kill data was determined from the information submitted with the wing and tail samples collected by conservation officers. This is best illustrated by the use of a map (See Map #2).

About all that can be determined from these data is that hunters have a preference for certain areas in the District. This is usually controlled by the presence or absence of old tote roads. Grouse hunters tend to stay on the old roads and very seldom venture into the forests. Their success would probably be much greater if they went into the bush and exploited the birds which receive little hunt pressure year after year. This can be easily seen if one looks at the success of the deer camp grouse hunter. Kill distribution may simply reflect access and areas covered by conservation officers.

Summery

1. Average brood count - 4.35.
2. Hunter success - on foot - 0.95 birds per hunter
   - from car - 0.94 birds per hunter
   - with dog - 0.89 birds per hunter
   - from deer hunt camps - 3.71 birds per hunter
3. Seven hundred and six birds sexed and aged.
4. Age ratio, adult female to juveniles - 1:4.41.

5. Fourteen spruce grouse reported shot within the District.
6. Grouse hunters prefer to hunt on old tote roads rather than in forested wilderness areas.
7. Exceptional hunter success for grouse hunters in deer camps. These hunters are in relatively inaccessible areas as far as the "true blue" grouse hunter is concerned - 3.71 birds per hunter.

Recommendations

1. Collect hunt statistics along with the collection of wings and tails. This will reveal the number of hunters involved with the temporal distribution of kill data.
2. Have a refresher course in the aging and sexing of grouse in 1965.
3. Continuation of the collection of information on grouse from the deer hunt camps.
4. Similar season for 1965.

Acknowledgments

I wish to thank all eight conservation officers for their dedicated support in collecting essential information. Special thanks must also be extended to all hunters who contributed their hunting efforts to the conservation officers.

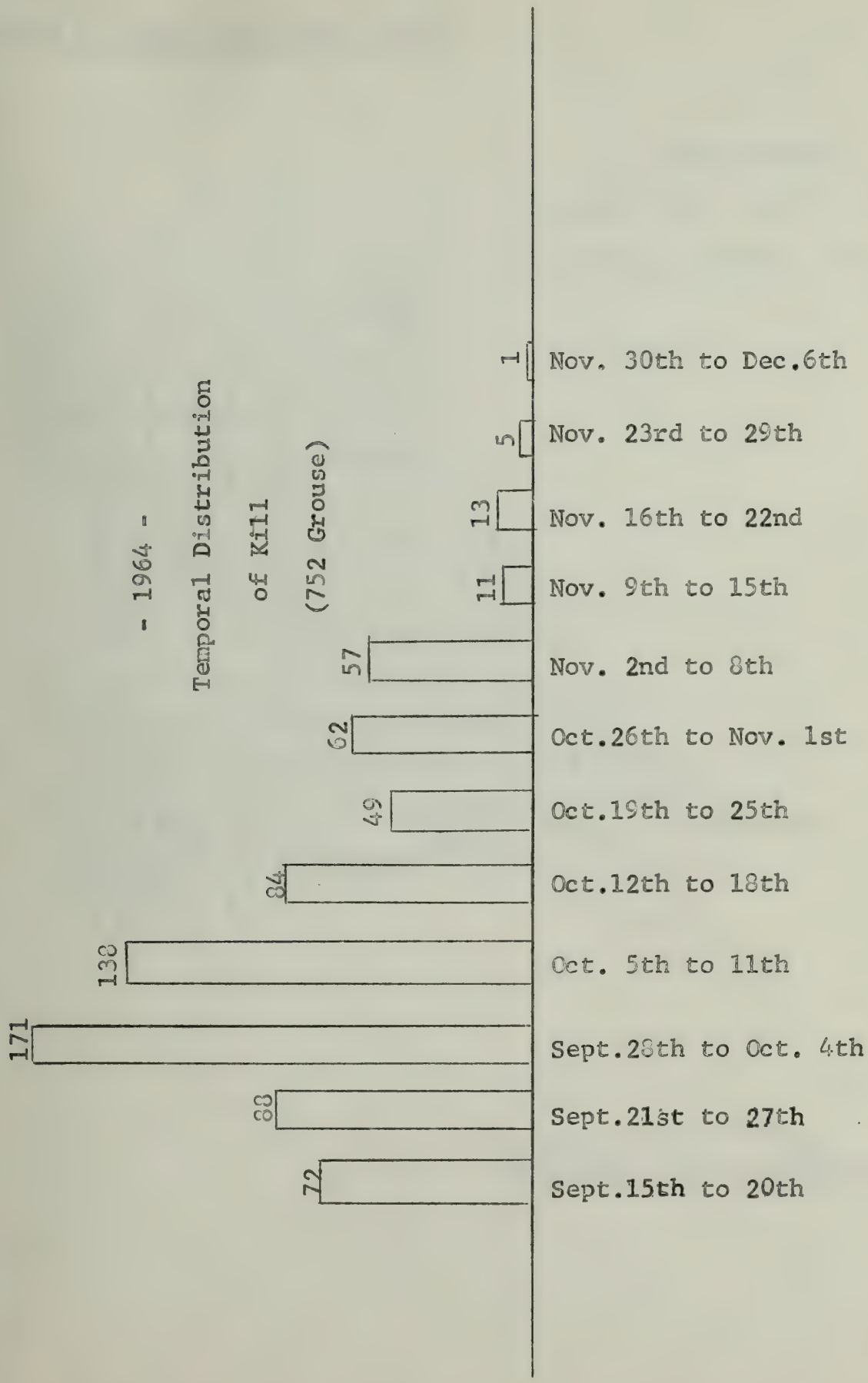

Temporal Distribution
of Kill
(752 Grouse)
- 1964 -
1
Nov. 30th to Dec.6th
5
Nov. 23rd to 29th
13
Nov. 16th to 22nd
11
Nov. 9th to 15th
57
Nov. 2nd to 8th
62
Oct.26th to Nov. 1st
49
Oct.19th to 25th
84
Oct.12th to 18th
138
Oct. 5th to 11th
171
Sept.28th to Oct. 4th
88
Sept.21st to 27th
72
Sept.15th to 20th

FIGURE 1

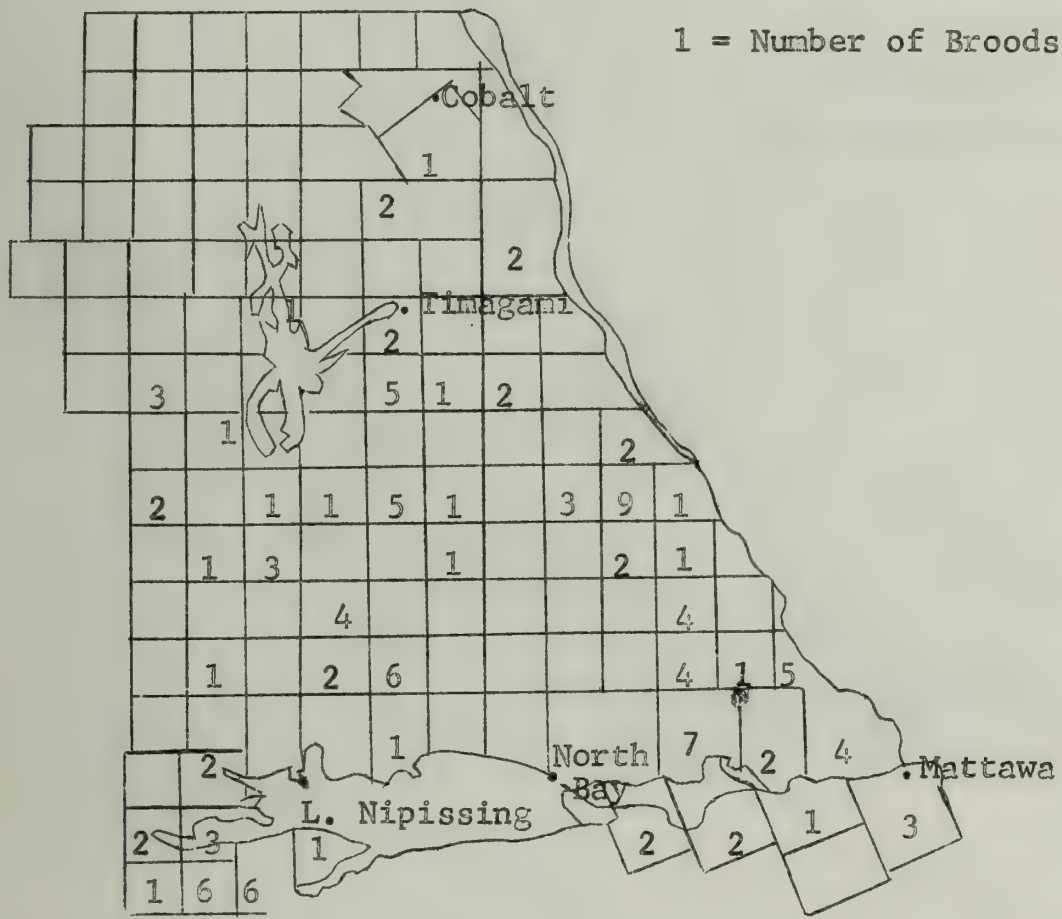
MAP #1

NORTH BAY ADMINISTRATIVE DISTRICT

Distribution

Grouse Brood Count - 1964

1 = Number of Broods Observed



MILES

20 15 10 5 0 20 40

MAP #2

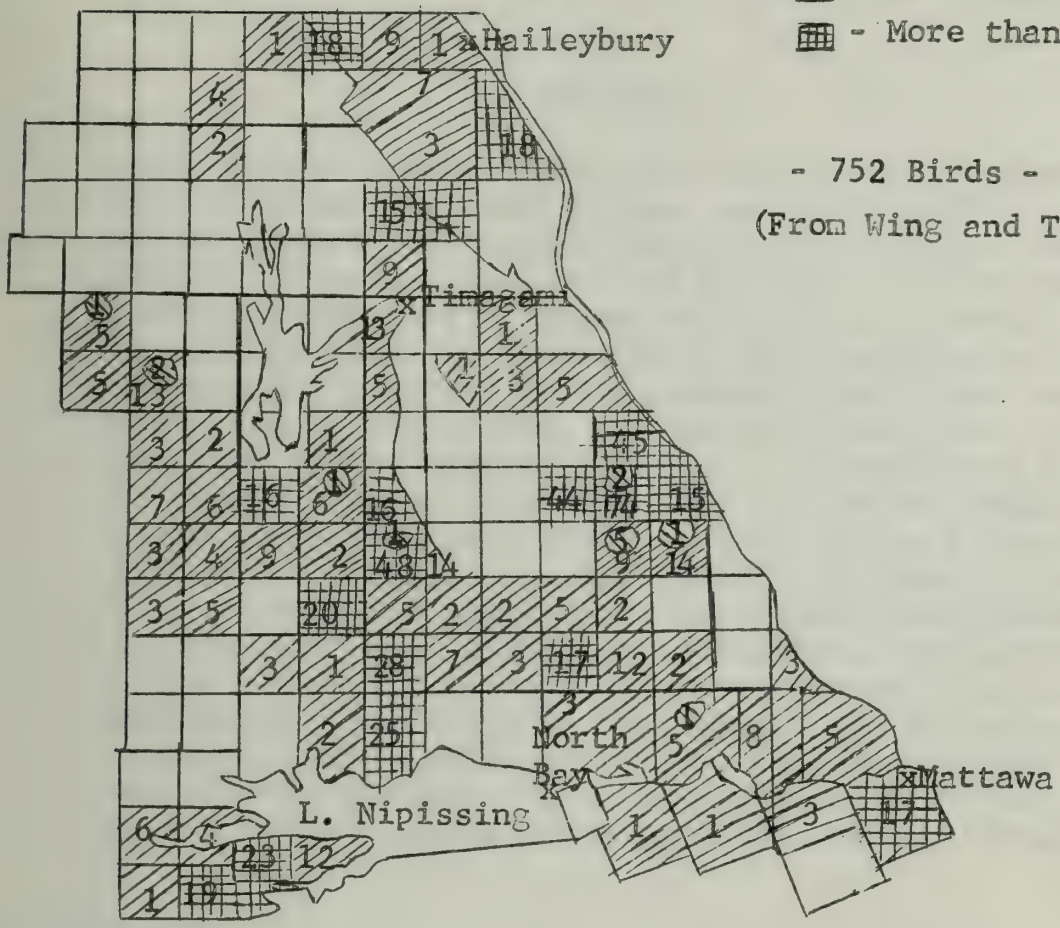
NORTH BAY ADMINISTRATIVE DISTRICT

Kill Distribution - 1964

- Spruce Grouse Kills
- Less than 15 Birds Shot
- More than 15 Birds Shot

- 752 Birds -

(From Wing and Tail Data)



MILES

20 15 10 5 0 20 40

MOOSE BROWSE AND PELLET GROUP SURVEYS ON TWO ISLANDS OF LAKE NIPIGON, 1964

by
B. H. Gibson, Biologist
Geraldton Forest District

Abstract

Moose browse and pellet group studies were conducted on two islands of Lake Nipigon during May, 1964. On the Shakespeare Island study area, 80.5 per cent of the balsam was browsed and 49.5 per cent on the Kelvin Island site. Balsam was the most abundant browse species. It contributed 92.9 per cent of the available browse on the Shakespeare Island study area. On Kelvin Island, balsam comprised 29.9 per cent of the available browse. A calculated total of 2021 live plants per acre was present on Shakespeare Island, compared with 3346 per acre on the Kelvin Island study area. A moose density of from 6.5 to 13.4 animals per square mile for Shakespeare Island is suggested from pellet group studies. On Kelvin Island, from 5.1 to 11.6 moose per square mile are indicated. The range is overbrowsed and is deteriorating. The carrying capacity of both islands is expected to decline. Immediate abolition of the Lake Nipigon Islands Crown Game Preserve is advised.

Introduction

We hope to conduct annual moose browse surveys in various areas of the District. These will be done to assess the moose range in specific localities, particularly where high populations of moose are found. Predictions on the future of the moose range can be made from browse surveys. Estimates of densities of moose present can be derived. We should be able to predict if the carrying capacity for moose on these study areas will change.

Purpose

Moose browse and pellet group studies were conducted on the two islands of Lake Nipigon because of the known high populations of moose on each island. During February, 1964, in our aerial survey, we saw 71 moose on Shakespeare Island and 33 on Kelvin Island. This resulted in densities of 3.3

moose per square mile for Shakespeare Island and 1.2 for Kelvin Island. These were probably minimum densities present.

Because of the high densities of moose present on the two islands, we suspected that range damage might be occurring. From the browse surveys we hoped to be able to assess browse conditions. For example, we wanted to learn the quality and quantity of moose browse present. Another aim was to establish the degree of past and current utilization of browse by moose. From the pellet group counts, we wanted to compare estimated population densities with the densities derived from our aerial surveys.

Descriptions of Study Areas

Kelvin Island is the largest of the islands of Lake Nipigon; it is 26.4 square miles in area. Shakespeare Island's area is 21.6 square miles. The two islands form approximately 15.9 per cent of the total islands area of 239 square miles. Both islands are in the Lake Nipigon Islands Crown Game Preserve.

The two islands are typically Archean. They are extremely rugged and hilly in some areas. Bluffs rising to 300 feet or more above Lake Nipigon are common. Well drained uplands with swamp in the lowlands are common. The area's relief class is one of moderately to strongly broken areas with moderate to steep slopes. The soil cover is primarily a silty sand, which is the result of an outwash plain. The soil is moderately fertile. Ten miles of water separate Kelvin Island from the nearest mainland, while Shakespeare Island is six miles from the closest mainland.

On the two islands, approximately two per cent is water; one per cent is non-productive forest land and 97 per cent is productive forest land. At the present time, there are no dense mature conifer stands on the two islands. Spruce budworm attacks about 1943 eliminated most of the mature balsam. Medium to heavy wind-throws of conifers and deterioration of hardwoods followed. This encouraged the growth of young balsam. Alder increased in the lowlands and draws and is now abundant.

The mixed woods have lost a large portion of their mature conifer content since 1947. Due to overmaturity, the hardwood components are breaking up rapidly. Dense second growth balsam up to 20 feet high forms approximately 66 per cent of the total productive forest areas of the two islands. Natural conversion of the stands to young conifers is imminent. There is some

regeneration of white and black spruce. There are still some black spruce, white spruce and white birch, but most of these are mature to over-mature. White cedar is common in the valleys.

On the browse survey sites, second growth balsam is extremely thick and will soon provide the climax forest. The dense balsam canopy combined with heavy browsing by moose is limiting regeneration of deciduous browse species to small open areas among the balsam. The scattered deciduous species are comprised mainly of maples, willows, mountain ash, dogwoods, poplars and white birch. Cherries and hazel were absent from both survey sites. Kelvin Island appears to be from 5 to 10 years behind Shakespeare Island in forest succession.

There have been no major disturbances on either of the two islands since 1943. No large fires have been reported. Minor cutting operations were conducted on portions of Shakespeare Island between 1940 and 1950. None of these were on the browse survey site, but were confined to the west and east shore. Mature and over-mature white and black spruce were utilized. Cutting operations for saw logs were conducted on the northwestern side of Kelvin Island during the same period. The 1964 browse survey site on Kelvin Island was near one of the previously logged localities; the Shakespeare Island study area was not.

Method

A. Browse Surveys

One square mile sample sites were selected on each of Shakespeare and Kelvin Islands. Shakespeare Island was surveyed between May 20 and May 22. Kelvin Island was sampled between May 27 and May 28. Ground vegetation and leaves were beginning to develop at the time of the survey. Developing leaves made identification of the browse species easier but did not hinder the recording of browse conditions.

Maps of a 2 inch to the mile scale were used. A Passmore-Hepburn range appraisal of a modified version was used. This was outlined in a memorandum by Biologist J. B. Dawson, dated April 11, 1963. Both islands were surveyed in a north-west to south-east direction. This direction was chosen so that we could cross the topography at right angles, thus reducing bias. The survey lines were pre-selected and marked on the field map. Aerial photographs assisted us in deciding the direction of the survey lines and the locations of the study areas. The photographs helped us to avoid large swamps and streams that we could

not cross. The sample areas were located near the shore of the islands to make access easier.

The sampling rate was 64 plots for each of the one square mile areas. Four parallel transects were run on each study area. Each line was one mile long and contained 16 plots. Individual plot size was 66 feet by 2 feet or $\frac{1}{330}$ of an acre. Spacing between plots was four chains. Compass bearings were maintained with a Sylva compass. A conservation officer, a biologist and a first year university biology student conducted the survey. The student participated for experience in browse surveys. We found it convenient for the student to follow behind the compass-man and tally-man and record nothing but pellet groups. This enabled the other two men to concentrate on proper compass bearings and the recording of browse information.

We recorded observations of browsing on ten common moose browse species; these are recorded on forms at the back of this report. These observations were made one foot on each side of the chain. Only plants with the mainstem within one foot on each side of the chain were recorded. Only plants between two and ten feet high were included. At the same time, the pellet group counts were made 6.6 feet on each side of the chain. Plot size for the pellet group counts was 1/50 of an acre. Entries on the browse tally forms were made under the following:

Plot Records

(a) Under L - The number of living plants of each of the ten species or genera was included. This column refers to live plants available for moose feed between two and ten feet above the ground. The maples, poplars and dogwoods were grouped so that one record was made for each genus.

(b) Under K - The number of stems of the 10 species killed by previous moose browsing. Not included were plants killed by other causes such as mice or hares.

(c) Under B - The number of plants in each of the 10 species which have been browsed during the current season (last fall to this spring).

(d) Under H - The number of plants in each species showing moderate to heavy browsing. The plant may produce more browse through branching, or it may be weakened or killed by browsing.

Note: If a plant was browsed or hedged, and alive, it was recorded in each of these categories on the tally form.

Compilation

The information collected gives the following data for each of the 10 plant species.

(1) Frequency index: A measure of distribution over the area sampled, calculated as

$$\frac{\text{Number of plots on which each species occurs}}{\text{Number of plots in sample}}$$

Species	Shakespeare Island	Kelvin Island
1. White birch	$\frac{7}{64} = 0.10$	$\frac{43}{64} = 0.67$
2. Balsam	$\frac{59}{64} = 0.92$	$\frac{52}{64} = 0.81$
3. Mountain ash	$\frac{2}{64} = 0.03$	$\frac{38}{64} = 0.59$
4. Willows	$\frac{0}{64} = 0.$	$\frac{4}{64} = 0.06$
5. Maples	$\frac{8}{64} = 0.12$	$\frac{44}{64} = 0.69$
6. Dogwoods	$\frac{0}{64} = 0$	$\frac{13}{64} = 0.20$
7. Cherries	$\frac{0}{64} = 0$	$\frac{0}{64} = 0$
8. Juneberries	$\frac{1}{64} = 0.01$	$\frac{3}{64} = 0.05$
9. Poplars	$\frac{1}{64} = 0.01$	$\frac{8}{64} = 0.12$
10. Hazel	$\frac{0}{64} = 0$	$\frac{0}{64} = 0$

Note: If a plot only had dead plants of a species on it, that plot was not recorded in the frequency index calculations.

(2) Living plants of each species per acre: A measure of productivity calculated as

$$\frac{\text{E L x 330}}{\text{number of plots in sample}}$$

Species	Shakespeare Island	Kelvin Island
1. White birch	$\frac{10 \times 330}{64} = 51.6$	$\frac{146 \times 330}{64} = 752.8$
2. Balsam	$\frac{364 \times 330}{64} = 1876.9$	$\frac{194 \times 330}{64} = 1000.3$
3. Mountain ash	$\frac{2 \times 330}{64} = 10.3$	$\frac{66 \times 330}{64} = 340.3$
4. Willows	$\frac{0 \times 330}{64} = 0$	$\frac{8 \times 330}{64} = 41.2$
5. Maples	$\frac{14 \times 330}{64} = 72.2$	$\frac{186 \times 330}{64} = 959.9$
6. Dogwoods	$\frac{0 \times 330}{64} = 0$	$\frac{33 \times 330}{64} = 170.2$
7. Cherries	$\frac{0 \times 330}{64} = 0$	$\frac{0 \times 330}{64} = 0$
8. Juneberries	$\frac{1 \times 330}{64} = 5.2$	$\frac{5 \times 330}{64} = 25.8$
9. Poplars	$\frac{1 \times 330}{64} = 5.2$	$\frac{11 \times 330}{64} = 56.7$
10. Hazel	$\frac{0 \times 330}{64} = 0$	$\frac{0 \times 330}{64} = 0$
	Calculated total live plants = 2021.4	Calculated total live plants = 3346.4

(3) Percentage of plants browsed: A measure of current use for each of the species, calculated as

$$\frac{E\ B \times 100}{E\ L}$$ (for each species)

Species	Shakespeare Island	Kelvin Island
1. White birch	$\frac{10 \times 100}{10} = 100.0\%$	$\frac{135 \times 100}{146} = 92.5\%$
2. Balsam	$\frac{293 \times 100}{364} = 80.5\%$	$\frac{96 \times 100}{194} = 49.5\%$
3. Mountain ash	$\frac{2 \times 100}{2} = 100.0\%$	$\frac{64 \times 100}{66} = 96.9\%$
4. Willows	$\frac{0 \times 100}{0} = 0.\ \%$	$\frac{7 \times 100}{8} = 87.5\%$
5. Maples	$\frac{11 \times 100}{14} = 78.6\%$	$\frac{166 \times 100}{186} = 89.2\%$

Species	Shakespeare Island	Kelvin Island
6. Dogwoods	$\frac{0 \times 100}{0} = 0.\%$	$\frac{33 \times 100}{33} = 100.0\%$
7. Cherries	$\frac{0 \times 100}{0} = 0.\%$	$\frac{0 \times 100}{0} = 0.\%$
8. Juneberries	$\frac{0 \times 100}{1} = 0.\%$	$\frac{1 \times 100}{5} = 20.0\%$
9. Poplars	$\frac{1 \times 100}{1} = 100.0\%$	$\frac{10 \times 100}{11} = 90.9\%$
10. Hazel	$\frac{0 \times 100}{0} = 0.\%$	$\frac{0 \times 100}{0} = 0.\%$

(4) Percentage of plants killed: A measure of past use for each of the 10 species, calculated as

$$\frac{E\ K \times 100}{E\ K + E\ L}$$

Species	Shakespeare Island	Kelvin Island
1. White birch	$\frac{16 \times 100}{16 + 10} = 61.5\%$	$\frac{9 \times 100}{9 + 146} = 5.8\%$
2. Balsam	$\frac{1 \times 100}{1 + 364} = 0.3\%$	$\frac{0 \times 100}{0 + 194} = 0.\%$
3. Mountain ash	$\frac{1 \times 100}{1 + 2} = 33.3\%$	$\frac{4 \times 100}{4 + 66} = 5.7\%$
4. Willows	$\frac{0 \times 100}{0 + 0} = 0.\%$	$\frac{1 \times 100}{1 + 8} = 11.1\%$
5. Maples	$\frac{19 \times 100}{19 + 14} = 57.6\%$	$\frac{67 \times 100}{67 + 186} = 26.5\%$
6. Dogwoods	$\frac{0 \times 100}{0 + 0} = 0.\%$	$\frac{12 \times 100}{12 + 33} = 26.7\%$
7. Cherries	$\frac{0 \times 100}{0 + 0} = 0.\%$	$\frac{0 \times 100}{0 + 0} = 0.\%$
8. Juneberries	$\frac{0 \times 100}{0 + 1} = 0.\%$	$\frac{0 \times 100}{0 + 5} = 0.\%$
9. Poplars	$\frac{0 \times 100}{0 + 1} = 0.\%$	$\frac{11 \times 100}{11 + 11} = 50.0\%$
10. Hazel	$\frac{0 \times 100}{0 + 0} = 0.\%$	$\frac{0 \times 100}{0 + 0} = 0.\%$

(5) Percentage of stems in each species which show hedging effect

an additional measure of past use calculated as

$$\frac{E\ H \times 100}{E\ L}$$

Species	Shakespeare Island	Kelvin Island
1. White birch	$\frac{7 \times 100}{10} = 70.0\%$	$\frac{42 \times 100}{146} = 28.8\%$
2. Balsam	$\frac{171 \times 100}{364} = 46.9\%$	$\frac{29 \times 100}{194} = 14.9\%$
3. Mountain ash	$\frac{2 \times 100}{2} = 100.\ \%$	$\frac{51 \times 100}{66} = 77.3\%$
4. Willows	$\frac{0 \times 100}{0} = 0.\ \%$	$\frac{0 \times 100}{3} = 0.\ \%$
5. Maples	$\frac{3 \times 100}{14} = 21.4\%$	$\frac{51 \times 100}{186} = 27.4\%$
6. Dogwoods	$\frac{0 \times 100}{0} = 0.\ \%$	$\frac{17 \times 100}{33} = 51.5\%$
7. Cherries	$\frac{0 \times 100}{1} = 0.\ \%$	$\frac{0 \times 100}{0} = 0.\ \%$
8. Juneberries	$\frac{0 \times 100}{1} = 0.\ \%$	$\frac{0 \times 100}{5} = 0.\ \%$
9. Poplars	$\frac{0 \times 100}{1} = 0.\ \%$	$\frac{4 \times 100}{11} = 36.4\%$
10. Hazel	$\frac{0 \times 100}{0} = 0.\ \%$	$\frac{0 \times 100}{0} = 0.\ \%$

(6) Percentage of available browse supplied by all ten species which is supplied by each of the species -

a measure of relative availability calculated as

$$\frac{E\ L\ \text{(single species)} \times 100}{E\ L\ \text{(all species)}}$$

Species	Shakespeare Island	Kelvin Island
1. White birch	$\frac{10 \times 100}{392} = 2.5\%$	$\frac{146 \times 100}{649} = 22.5\%$
2. Balsam	$\frac{364 \times 100}{392} = 92.9\%$	$\frac{194 \times 100}{649} = 29.9\%$
3. Mountain ash	$\frac{2 \times 100}{392} = 0.5\%$	$\frac{66 \times 100}{649} = 10.2\%$
4. Willows	$\frac{0 \times 100}{392} = 0.0\%$	$\frac{8 \times 100}{649} = 1.2\%$
5. Maples	$\frac{14 \times 100}{392} = 3.6\%$	$\frac{186 \times 100}{649} = 28.7\%$
6. Dogwoods	$\frac{0 \times 100}{392} = 0.0\%$	$\frac{33 \times 100}{649} = 5.1\%$
7. Cherries	$\frac{0 \times 100}{392} = 0. \%$	$\frac{0 \times 100}{649} = 0. \%$
8. Juneberries	$\frac{1 \times 100}{392} = 0.2\%$	$\frac{5 \times 100}{649} = 0.8\%$
9. Poplars	$\frac{1 \times 100}{392} = 0.2\%$	$\frac{11 \times 100}{649} = 1.7\%$
10. Hazel	$\frac{0 \times 100}{392} = 0. \%$	$\frac{0 \times 100}{649} = 0. \%$

Observations and Discussion on Browse Studies

(1) Frequency index

Balsam was the most widely distributed species on both islands. Fifty-nine of 64 plots on Shakespeare Island and 52 on Kelvin Island supported balsam. All of the species tabulated were more widely distributed over Kelvin Island than Shakespeare Island except for balsam. Dogwoods, willows, cherries and hazel were absent on Shakespeare Island plots and cherries and hazel did not occur on any Kelvin Island plots.

There are several possible reasons for the low frequency indices of all species except balsam, particularly on Shakespeare Island. One explanation is that balsam has "shaded-out" regeneration of most of the deciduous growth, except in open areas.

Browsing pressure was less severe on Kelvin Island; this would allow some regeneration and spreading of deciduous species to occur. This was not possible for Shakespeare Island because deciduous browse species were utilized by moose as soon as they regenerated on most plots and were prevented from spreading.

(2) Living plants of each species per acre

Balsam contributed a calculated total of 1877 live plants per acre on Shakespeare Island; this was 92.9 per cent of the calculated total number of 2021 live plants on the sample area. On Kelvin Island, balsam accounted for a calculated total of 1000 live plants per acre or 29.9 per cent of the calculated total of 3346 live plants per acre.

The calculated totals of 2021 live browse plants per acre for Shakespeare Island and 3346 per acre for the Kelvin Island study area compare with a calculated total of 10,264 for the 1963 study area (Gibson, 1963). In the 1963 browse survey area, 0.7 moose per square mile was recorded in the 1960 aerial survey. In the 1963 browse studies, we concluded that, even with a calculated total of 10,264 living plants per acre, the range was approaching its maximum carrying capacity.

Kelvin Island had 1325 more live plants per acre than Shakespeare Island or 65.6 per cent more browse. Only 19.7 per cent as much browse was available on Shakespeare Island compared with the 1963 study site. Kelvin Island had 32.6 per cent as much browse as the 1963 study area. Shakespeare Island, with 3.3 moose per square mile and Kelvin Island with 1.2 per square mile had moose densities of almost five times and two times greater respectively than the 0.7 per square mile for the 1963 study area. Rough comparisons of browse abundance on Kelvin and Shakespeare Islands with the 1963 study area suggest that the carrying capacity for both islands is exceeded.

(3) Percentage of plants browsed

White birch, balsam, mountain ash, maples, dogwoods and poplars, where present, were utilized heavily by moose on both islands. For most of these species, from 75 to 100 per cent of the plants were browsed. This indicated heavy utilization of any deciduous browse species.

On Shakespeare Island, in particular, deciduous browse was so scarce that browsing was confined mainly to balsam with 80.5 per cent of this species browsed. On Kelvin Island, with its greater availability of deciduous browse, 49.5 per cent of the balsam was utilized. On the Shakespeare Island study area, moose

had browsed an average of 93.8 per cent of the plants, compared with 67.0 per cent on Kelvin Island. This compares with an average of 52.0 per cent in the 1963 study (Gibson, 1963). White birch appeared to be a "preferred" species with 100.0 per cent browsed on Shakespeare Island and 92.5 per cent on Kelvin Island.

(4) Percentage of plants killed

White birch showed the highest kill of any species on Shakespeare Island with a mortality of 61.5 per cent. Only 5.8 per cent of this species was killed on Kelvin Island. Maples, with a 57.6 per cent mortality, showed the second highest percentage kill on Shakespeare Island and the third highest on Kelvin Island with 26.5 per cent mortality. On Shakespeare Island, many of the species did not figure in the killed column because they were not present.

For the four species listed in the killed column for Shakespeare Island, an average of 38.2 per cent of these was killed. Kelvin Island showed an average kill of 21.0 per cent for the six species listed as killed.

Balsam and poplar saplings were observed frequently that had been straddled and "ridden down" by moose. This was seen on both islands, but it was seen more often on Shakespeare. One example of this on Shakespeare Island was just off plot 21 on line 2. An oval-shaped patch of second growth balsam about 350 feet in circumference was obliterated. Some of these had been wiped out from browsing; the majority died from being ridden down by moose. Stems that had obviously been killed from straddling were not included in the totals for trees killed by browsing. Peterson (1955: 114) claims that riding down trees is a habit of moose in areas of scarce food supply. The degree to which balsam was ridden down and the shortage of deciduous browse on the two islands tend to confirm Peterson's statement.

(5) Percentage of hedged plants

Mountain ash was the most heavily hedged species, with 100 per cent and 77.3 per cent hedged on Shakespeare Island and Kelvin Island respectively. The figure for Shakespeare Island is not significant because only two live ash plants were recorded. In the 1963 study, mountain ash showed the second highest rate of hedging of the ten species with 21.4 per cent. This species appears to be a "preferred" browse species.

Balsam showed a hedged percentage of 46.9 on Shakespeare Island compared with 14.9 per cent for Kelvin Island. In the 1963 study, 24.3 per cent of the balsam were hedged. I think that balsam was more severely hedged on Shakespeare Island because of this island's poorer range quality. I do not think that balsam is a "preferred" species. Probably, as Pimlott states in "The Ecology and Management of Moose in North America", balsam is only eaten in quantity by moose in areas of high moose density where the carrying capacity is reached or exceeded. Simkin (1959) stated that the percentage of balsam hedged was a good indication of the range's quality. In other words, the poorer the range quality, the greater will be the degree of hedging of balsam. If Simkin is correct in his belief, then it would appear that the Shakespeare Island study area is considerably poorer than Kelvin Island as moose range.

(6) Percentage of available browse

Balsam supplied 92.9 per cent of the available browse on the Shakespeare Island study site and 29.9 per cent on the Kelvin Island study area. Next to balsam, maples supplied the highest individual percentage of browse on Shakespeare Island with 3.6 per cent. Kelvin Island had five species that each supplied five per cent or more of the available browse.

Conclusions on Browse Studies

I believe that the Kelvin Island study area is better as moose range than the Shakespeare Island site. Kelvin Island is from five to ten years behind Shakespeare Island in forest succession and has a greater number and variety of browse species. While the range is deteriorating due to browsing on both islands, Kelvin Island should provide better range than Shakespeare Island for the next five to ten years. Little regeneration of deciduous growth will occur on both islands. Much of the balsam presently available to moose on the two islands will soon be out of reach.

Assuming that the surveyed areas on both islands are representative of the islands, then I predict that a limiting factor is going to control the moose herds. A shortage of winter food is likely to develop soon; diseases, malnutrition and parasites could reduce the herds. Reproduction could decline and stabilize the herds.

I believe that balsam is not an ideal moose browse species. I think that it is only consumed in quantity by moose when deciduous species are relatively unavailable. Availability of balsam, rather than preference, appears to be the key to the utilization of this species by moose.

B. Population Estimates from Pellet Group Studies

Moose pellet group counts were recorded at the same time as the browse surveys. In mixed woods, all pellet groups lying on top of the leaves were recorded. Plot size was 1/50 of an acre. Strip width was 13.2 feet or 6.6. feet on each side of the chain. Leaf-fall during the autumn of 1963 was completed by October 20. A period of approximately 215 days lapsed from leaf-fall to the completion of the survey on Shakespeare Island and 220 days for Kelvin Island. All pellet groups lying on top of the leaves could be assumed to have been deposited after October 20. In coniferous areas, pellet groups were recorded if, by colour and texture, they appeared to have been dropped since the leaf-fall.

The number of pellet groups per plot varied from 0 to a high of four on Shakespeare Island. Fifty-six pellet piles were observed. An average of 0.87 pellet groups was seen on the 64 plots. On Kelvin Island 48 crotisings were observed on the 64 plots. This resulted in 0.75 groups per plot. From 0 to a high of five groups were recorded on the Kelvin Island plots.

Calculations from Pellet Group Counts

(a) Shakespeare Island

1. Average number of pellet groups per acre calculated as the average count per plot x 50

$$\text{Average count per plot} = \frac{56}{64} = 0.87 \text{ pellet groups}$$

Pellet groups per acre = 0.87 x 50 = 43.5 average

2. Moose-days per square mile, calculated as

$$\frac{\text{Pellet groups per acre} \times 640}{\text{Deposition rate (13)}}$$

or $\frac{43.5 \times 640}{13} = \frac{27840.0}{13} = 2141.5$ moose-days per square mile

3. Moose per square mile, calculated as

$$\frac{\text{Moose-days per square mile}}{\text{Number of days of pellet deposition}}$$

or $\frac{2141.5}{215} = 9.96 = 10.0$

Statistical Analysis

(a) Shakespeare Island

$0_{X=2}$

X	n	nX	x'	nx'	nx'^{2}
0	35	0	-2	-70	140
1	14	14	-1	-14	14
2	7	14	0	0	0
3	4	12	+1	4	4
4	4	16	+2	8	16
	64	56		-72	174

In the preceding table

X - denotes the pellet group class
n - denotes the number of pellet groups in each pellet group class
x' - denotes the deviation of each observed pellet group class from the arbitrary origin i.e. $X-0_X$

From the formula

$S(x^2)=S(x'^2)-\frac{(S(x'))^2}{N}$ we can determine the standard deviation.

or $S(x^2)=174-\frac{(-72)^2}{64}$

$=174-81$

$= 93.0$

Variance or $sx^2=\frac{S(x^2)}{N-1}$

or $sx^2 = \frac{93.0}{63} = 1.4762$

The standard deviation $= \sqrt{1.4762} = 1.2150$

The standard error $= \frac{\text{standard deviation}}{\sqrt{N}}$

or $S\bar{x} = \frac{s}{\sqrt{N}} = \frac{1.2150}{\sqrt{64}} = 0.1519$

Applying a "t" test from the formula $\pm t = \frac{(\bar{x}-u)}{S_{\bar{x}}}$ we can arrive at a statement of confidence about the sample mean x using the five per cent level of probability.

Transposing in the above equation, $u = \bar{x} \pm t S_{\bar{x}}$

From the "t" table $t_{.05}$ for 63 degrees of freedom = 2.000

Pellet group mean = u = sample mean $\pm$ ($t_{.05}$) (standard error)

or u = 0.87 + (2.000) (0.1519) = 1.17 for upper limits

or u = 0.87 - (2.000) (0.1519) = 0.57 for lower limits

Therefore, the mean number of pellet groups per plot on the sampled area should range from 0.57 to 1.17. This range should be correct at the 95 per cent fiducial interval.

(1) The moose pellet groups per acre on the sampled area should range from:

50 x 1.17 = 58.50 for upper limits

to 50 x 0.57 = 28.50 for lower limits

(2) Moose-days per square mile

$= 58.50 \times \frac{640}{13}$ = 2880.0 for upper limits

or $28.50 \times \frac{640}{13}$ = 1403.1 for lower limits

Therefore, on the sampled area, the moose-days per square mile should range from 1403.1 to 2880.0 at the 95 per cent fiducial interval.

(3) Moose per square mile

$= \frac{2880.0}{215} = 13.39$ or 13.4

or $\frac{1403.1}{215} = 6.53$ or 6.5

Therefore, on the sampled area, the mean number of moose per square mile should range from 6.5 to 13.4 at the 95 per cent fiducial interval.

(b) Kelvin Island

1. Average number of pellet groups per plot = $\frac{48}{64}$ = 0.75
   Pellet groups per acre = 0.75 x 50 = 37.5 average

2. Moose-days per square mile = $\frac{37.5 \times 640}{13}$ = 1846.2

3. Moose per square mile = $\frac{1846.2}{220}$ = 8.39 or 8.4

$\sigma_X = 2$

X	n	nX	x'	nx'	nx'^{2}
0	38	0	-2	-76	152
1	13	13	-1	-13	13
2	8	16	0	0	0
3	2	6	+1	+2	2
4	2	8	+2	+4	8
5	1	5	+3	+3	9
	64	48		-80	184

Again using the formula $S(x^2) = S(x'^2) - \frac{(S(x'))^2}{N}$ we can determine the standard deviation as we did for Shakespeare Island.

$$S(x^2) = 184 - \frac{(-80)^2}{64}$$

$$= 184 - \frac{6400}{64}$$

$$= 184 - 100$$

or $S(x^2) = 84.0$

Variance or $sx^2 = \frac{S(x^2)}{N-1}$

or $sx^2 = \frac{84.0}{63} = 1.3333$

The standard deviation = $\sqrt{1.33} = 1.1547$

The standard error = $\frac{S}{\sqrt{64}} = \frac{1.1547}{8} = 0.1443$

Applying a "t" test in the formula $u = \bar{x} \pm t S\bar{x}$ and again $t_{.05}$ for 63 degrees of freedom = 2.000

Pellet group mean = u = sample mean $\pm$ ($t_{.05}$) (standard error)
or u = 0.75 + (2.000) (0.1443) = 1.04 for upper limits
or u = 0.75 - (2.000) (0.1443) = 0.46 for lower limits
The mean number of pellet groups per plot on the sampled area should range from 0.46 to 1.04

(1) Moose pellet groups per acre on the sampled area should range from

50 x 1.04 = 52.00 for upper limits
to 50 x 0.46 = 23.00 for lower limits

(2) Moose-days per square mile

$= 52.00 \times \frac{640}{13} = \frac{33280.0}{13} = 2560.0$ for upper limits

or $23.00 \times \frac{640}{13} = 14720.0 = 1132.3$ for lower limits

Thus, on the sampled area, the moose-days per square mile should range from 1132.3 to 2560.0

(3) Moose per square mile

$= \frac{2560.0}{220} = 11.6$ for upper limits

or $\frac{1132.3}{220} = 5.1$ for lower limits

Therefore, on the sampled area the mean number of moose per square mile should range from 5.1 to 11.6 at the 95 per cent fiducial interval.

Discussion and Conclusions on Pellet Group Counts

I suspect that the mean daily defecation rate for moose is higher than 13. The statistically derived densities of moose for the Shakespeare Island study area range from approximately two to four times the observed density of 3.3 per square mile. For Kelvin Island the densities range from approximately four times greater than the observed density of 1.2 for the lower fiducial limit, to almost nine times greater for the upper limit. If the sampled areas are representative of the two islands, it does not seem possible that there could be from two to ten times more moose on the two islands than were observed. A higher mean rate of daily defecation would reduce the calculated densities of moose considerably.

Densities of moose derived from aerial counts are no doubt minimum. In heavy coniferous cover like on Shakespeare Island, some moose could not be counted. However, it seems unlikely that a moose density of more than four to five animals per square mile is present on this island. On Kelvin Island a density of even three to four animals per square mile seems improbable.

The proper aging of pellet groups is not as much of a problem now. During the 1963 study I had doubts that we were aging all groups accurately. With past experience, I believe that we are now aging the groups with more accuracy. It is unlikely that improper aging of pellet groups has biased our results much during the 1964 study.

Recommendations

1. I recommend that the Lake Nipigon Islands Crown Game Preserve be abolished immediately. Moose on the islands are being wasted by not being hunted. An immediate reduction of the moose herds on Kelvin and Shakespeare Islands is advised. This might retard or even prevent a natural decline. Hunting would be the logical method of accomplishing the reduction. I think that densities of from one to two moose per square mile would be a maximum that the two islands will support for an extended period. These densities are likely more compatible with the long-term carrying capacities of the two islands.

2. I recommend the use of herbicides on balsam on Shakespeare and Kelvin Islands. This would be on an experimental basis. We could discover if deciduous browse species will regenerate when balsam is killed. If browse species do regenerate in the treated areas, we could discover how long this takes. It is possible, though, that moose will consume regenerating deciduous growth as fast as it appears. In spite of this, we could probably discover what conditions and time are necessary to create new browse growth.

   A disturbance of some kind is needed to encourage new deciduous browse growth on Shakespeare and Kelvin Islands. A natural disturbance like a spruce budworm attack on the balsam would release the understory. Unfortunately we cannot predict that this will occur until the balsam mature. This might take from 20 to 40 years. Man-caused disturbances such as the use of herbicides and prescribed burns would encourage regeneration of browse species. It would be of great management value to discover if either fire or a

herbicide was more effective in creating new moose browse. Unfortunately, prescribed burns on Shakespeare and Kelvin Islands might be dangerous. Blow-down of over-mature trees is heavy in some area. A fire could become uncontrollable. The advisability of using prescribed burns should be determined by timber and forest protection personnel.

3. I suggest that we conduct browse surveys at two year intervals on Shakespeare and Kelvin Islands. A change in browsing pressure on balsam should occur as much of this species approaches maturity and grows out of reach of moose. These changes in browsing could be followed by browse surveys at two year intervals.

4. Annual winter aerial surveys using the Gogama method are advised for the islands. Aerial counts of moose would be of great management value, particularly when hunting is legalized.

5. If possible, moose should be tagged on Shakespeare and Kelvin Islands when the Preserve is abolished. Recovery of tagged moose might indicate that there are not homogeneous populations of moose on the two islands. Movements between them and the mainland or other islands might be occurring. If the populations are not isolated, then this would have to be considered in any management program undertaken.

6. Winter aerial surveys should be conducted over any proposed browse survey sites. Aerial counts of moose probably only give minimum densities of moose because some moose are not observed. However, aerial counts will at least provide some basis of comparison between population estimates derived from pellet group surveys and numbers of moose actually present. The aerial counts should be done during the winter preceding the browse studies.

7. We need to know how many times a day Ontario moose defecate. The currently used deposition rate of 13 times daily appears to me to be an arbitrary figure. Undoubtedly, diet affects the rate.

8. Browse surveys should be conducted just as the browse species start to "leaf-out". This makes identification of species easier. It does not impair assessment of browse conditions.

Summary

Moose browse and pellet group studies were conducted during May, 1964 on two islands of Lake Nipigon. Shakespeare and Kelvin Islands were selected because of their respective densities of 3.3 and 1.2 moose per square mile. Utilization of browse by moose was great. For most of the browse species, from 75 to 100 per cent were utilized as food. On the Shakespeare Island study area, 80.5 per cent of the balsam was browsed; 49.5 per cent of this species was utilized on Kelvin Island. Balsam was the most abundant species. It contributed 92.9 per cent of the available browse on Shakespeare Island and 29.9 per cent of Kelvin Island. An average of 38.2 per cent of the browse was killed on Shakespeare Island and 21.0 per cent on Kelvin Island. Balsam was 46.9 per cent hedged on Shakespeare Island and 14.9 per cent on Kelvin Island. Calculated totals of 2021 live plants per acre for Shakespeare Island and 3346 for Kelvin Island are present.

Calculations from pellet group counts suggest a density of from 6.5 to 13.4 moose per square mile for the Shakespeare Island study area. On the Kelvin Island study area, from 5.1 to 11.6 animals per square mile are indicated. The range on both islands is deteriorating rapidly due to over-browsing. Regeneration of deciduous species is negligible on Shakespeare Island. The carrying capacities for moose of both islands will likely decline. Immediate abolition of the Lake Nipigon Islands Crown Game Preserve is advised.

Acknowledgments

I would like to especially thank Mr. G. T. Marek, unit management forester, MacDiarmid Division. Mr. Marek provided me with an excellent description of the timber types on the Lake Nipigon Islands. His knowledge of the islands is intimate. Special thanks are also due to Conservation Officer J. A. Chappel for his part in the browse surveys. His interest, co-operation and ability to identify plant species helped the study immeasurably. Thanks are due also to Mr. R. Boultbee, Regional Forester, Fort Frances, for his criticisms of the statistical analyses.

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ONTARIO DEPARTMENT OF LANDS AND FORESTS

MOOSE BROWSE TALLY FORM*

NAME OF AREA Shakespeare Island SIZE IN ACRES 640 DATE May 20/64

LINE NO. 1 PLOTS 1 TO 9

DISTRICT Geraldton COUNTY _____ TOWNSHIP Unsurveyed

PLOT SPACING 4 chains COMPASS COURSE North-west LOCATION Lake Nipigon

CREW J. Chappel, B. H. Gibson

PLOT NO.	1	2	3	4	5	6	7	8	9	TOTALS	
SPECIES	K·L / H·B	K·L / H·B	K·L / H·B	K·L / H·B	K·L / H·B	K·L / H·B	K·L / H·B	K·L / H·B	K·L / H·B	EK / EH	EL / EB
WHITE BIRCH				2 / 2·2	1·2 / ·2					1 / 2	4 / 4
BALSAM	5 / 1·1	7 / ·1	2 / 2·2	1·1 / 1·1	6 / 2·4		10 / 6·7	3 / 2·2	1 / 1·1	1 / 15	35 / 19
MOUNTAIN ASH											
WILLOWS											
MAPLES			4 / 1·1		1 / ·1					0 / 1	5 / 2
DOGWOODS											
BERRIES											
JUNEBERRIES	1									0 / 0	1 / 0
POPLARS											
HAZEL											

Description of Site, Stand, Previous Disturbance

F.R. . Map
Reference No 495882

Sketch of Area Surveyed

Line No. ___ Plot No. _____

←5→
Chains

*A series of 16 similar moose browse tally forms accompanied the original report on file in the Fish and Wildlife Library, Maple.

LAKE TROUT SPAWN COLLECTION BARIL LAKE, PORT ARTHUR DISTRICT, 1964

by
C. E. Monk
Fisheries Management Officer

Abstract

A total of 115,000 lake trout eggs were collected between October 7 and 14 inclusive. A two man crew (Paul Bougie, commercial fishing expert from the Port Arthur Net Section and Harry Height, spawntaker from the Dorion Hatchery) were responsible for the successful netting and spawning operations. Working on the axiom that lake trout in Ontario spawn in shallow water (less than 15 feet) contributed to the success of this project. Practically all spawn was collected from lake trout impounded in a 6-foot trap-net.

Introduction

Our hatchery at Port Arthur requires fresh healthy lake trout spawn each fall for stocking purposes (especially Lake Superior). Baril Lake is noted for its healthy and robust lake trout. Rumours persisted that these trout spawned in uncountable numbers, and could be easily captured. The lake is not commercially fished and angling intensity is medium. It was decided to collect spawn from Baril Lake to supply part of the Port Arthur Hatchery requirements.

Location

Baril Lake is located by means of a short portage from Baril Bay of Lac des Mille Lacs at Longitude 90°45' and Latitude 48°45'. The primary spawning shoals are located in a narrow expanse directly north of the Owakonze Boys' Camp. Other less utilized shoals are located throughout Baril Lake.

Description of Shoal

The "L" shaped shoal extends from the island northward about two-thirds of the narrows, then parallels the mainland westward about 260 feet. Small rock rubble and shale interspersed with a few boulders at the shallow outside angle of the shoal comprises the littoral zone. Depth varied on the shoal at the time of spawning from two to eight feet (Figure I). Extensive drop-offs were noted on both sides of the shoal. The trough-like bottom of the narrows west of the shoal sloped gradually from six to twenty-four to eight feet (Figure I).

Equipment

The crew, two 8-foot trap-nets, one 10-foot trap-net, and one 6-foot trap-net were flown in by Department aircraft O.D.P. on September 28. A gill net (100 yards long, 18 meshes deep, 4-1/2 inch extension measure, white nylon) was taken to test condition of fish prior to spawning and for locating spawning shoals. In addition: 3 egg cases, various spawning pans, pails, etcetera, and 500 pounds of ice were used. A 16 foot punt and an 18 H.P. outboard motor were used to set and operate the nets, transport spawn and move equipment.

Eight-foot trap-net - Excepting the top of the house and harts which were of four-inch mesh, the net was made of two-inch mesh tarred cotton webbing. The wings were 16 feet long and the harts were not squared. The tunnel was eight feet long beginning at the house and extending seven feet into the crib with a 10-inch opening. The house was 8' x 8' x 16' long - 200' of tarred two-inch mesh lead accompanied this trap-net.

Six-foot trap net: Made of two-inch mesh nylon with a crib 6' x 6' x 12', a house of 6' x 6' x 12', harts and wings eight feet and 10 feet respectively. The tunnel opening was eight inches square. Two leads (220 feet long and 50 feet long) of 2-1/2-inch mesh nylon were used with this net (Figure II).

Methods

Figures II vividly portrays the technique of impounding ripe spawning lake trout in the shallow 6-foot trap-net.

Placing the 10-foot trap-net across the narrows (west of the L-shaped shoal) would impound an impressive number of lake trout-(a gill net test in this location revealed a large concentration of lake trout). Fish trapped for spawning purposes, however, must be ripe. Experience had taught Mr. Bougie that setting trap-nets for lake trout in depths of more than 12 feet results in the capture of: hunters, greens, and immatures - requires much handling, sorting and releasing - involves hard work and produces a small amount of spawn. Furthermore, once captured and released these trout seldom return to that location.

It was decided to use shallow water trap-nets directly on the shoal.

The 6-foot trap-nets strategically covered the western extremity of the shoal - 220 feet of six-foot lead divided the entire east-west shoal from the trap to its eastern terminus. A 50 foot, 6-foot lead was attached to the northern wing of this trap-net to ensure maximum trapping efficiency of all trout ascending onto the shoal (Figure II).

The 8-foot trap-net was set near the shore at the southern end of the shoal - 200 feet of lead from this net extended northerly to bisect the six-foot lead about 15 feet from its eastern extension - (the leads were sewn together) Figure II)

The nets were attended each morning.

Results

The trap-nets were fishing on October 6 and the first spawners captured on October 7. With the exception of six green fish on October 7 all lake trout captures were mature and ripe. A temporal distribution of the captured trout for each net from October 7 to 14 inclusive is submitted in Table I.

The eggs were water-hardened and cared for in an ice house near the camp - later taken to the hatchery at Port Arthur.

Another 8-foot trap-net set on a shoal near the western end of the lake captured 30 lake trout between October 7 and 13, inclusive. Various tests with the gill-net in deeper waters produced no spawning trout.

All lake trout from which spawn was taken were released. Water temperatures during spawning are noted in Table II.

Discussion

We note the number of ripe lake trout captured in the shallow 6-foot trap-net (160) as compared to the large 8-foot trap-net (15). The fish are probably responsible; natural tendencies to lead outward to the main lake rather than inward to the shore seems a logical assumption. It is significant to conclude that the lake trout captured were ripe and contained in equipment easily handled by two men in a small boat with a minimum of effort. This efficiency is especially meritorious where fly-in projects of this type are involved.

At the time of writing hatchery personnel indicate the eggs from Baril Lake are expected to hatch in excess of 90 per cent of the total spawn taken.

Port Arthur District is committed to stocking 2,000 fingerlings lake trout in Baril Lake during 1965.

Acknowledgments

On behalf of Paul Bougie and Harry Height, appreciation for assistance is extended to the following Department Personnel: N. Glennie (Pilot), A. Burtt (Pilot), C. A. Elsey (Fish & Wildlife Supervisor), H. R. Timmermann (District Biologist), W. McKeown (Conservation Officer), and E. Ostrum (Hatchery Assistant).

TABLE I

TEMPORAL DISTRIBUTION OF LAKE TROUT CAPTURES

October 7 - 14 Inclusive

Baril Lake

1964

Date	6-Foot Trap-Net	8-Foot Trap-Net	Total
October 7	*30	5	35
October 8	29	2	31
October 9	41	1	42
October 10	17	0	17
October 11	11	0	11
October 12	9	4	13
October 13	12	2	14
October 14	11	1	12
	160	15	175

NOTE: - Sexes Combined
* - Includes 6 green lake trout
Total of 169 ripe spawning lake trout in both trap-nets

TABLE II

WATER TEMPERATURES OF BARIL LAKE

September 28 - October 14 Inclusive

Date	Temperature F°
September 28	52°
September 29	52°
September 30	50°
October 1	52°
October 2	50°
October 3	48°
October 4	46°
October 5	46°
October 6	46°
October 7	46°
October 8	46°
October 9	44°
October 10	46°
October 11	46°
October 12	46°
October 13	46°
October 14	48°

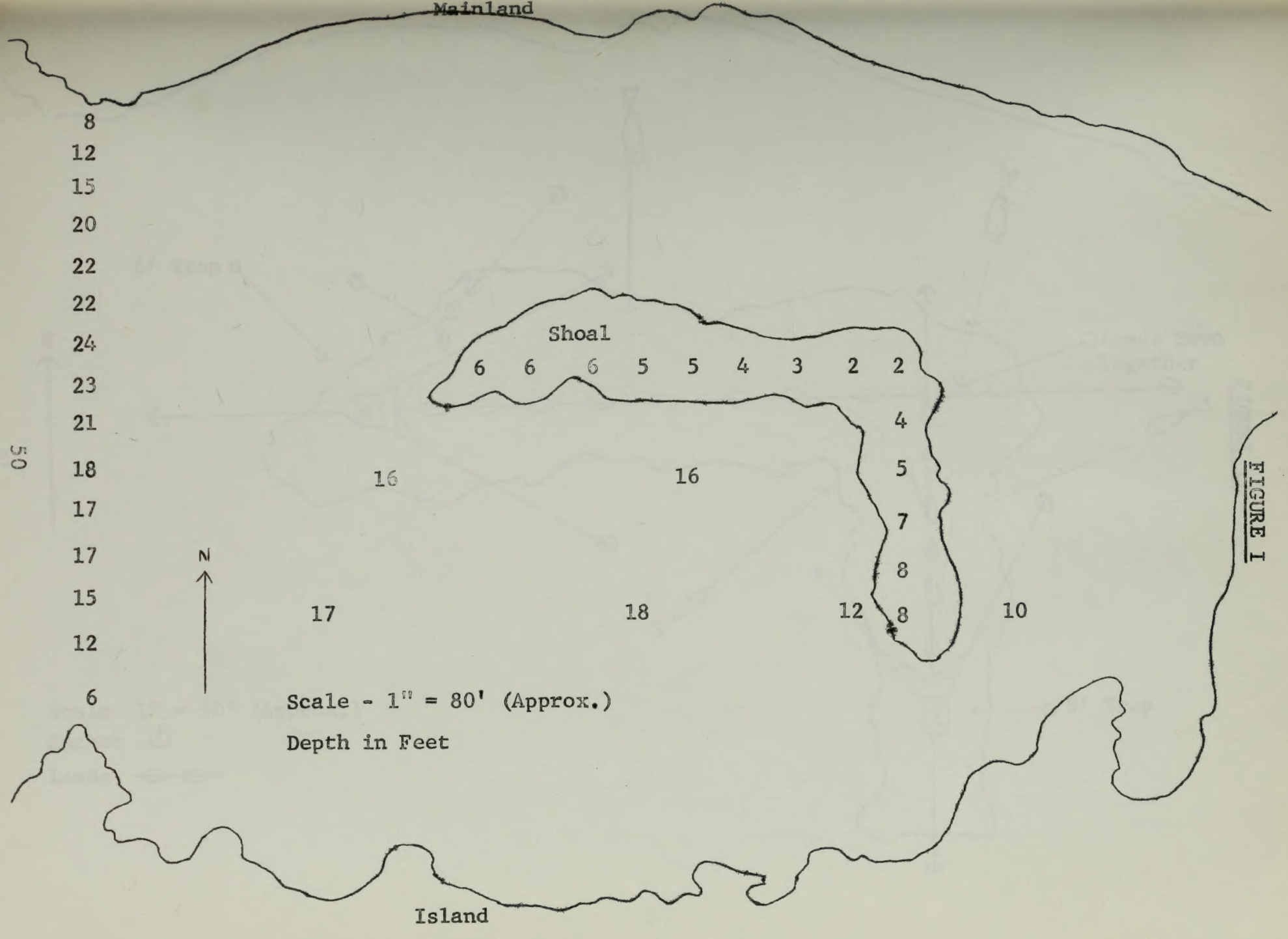
Mainland
8
12
15
20
22
22
24
23
21
18
17
17
15
12
6
Shoal
6 6 6 5 5 4 3 2 2
4
5
7
8
8
16
16
17
18
12
10
N
Scale - 1" = 80' (Approx.)
Depth in Feet
Island

FIGURE I

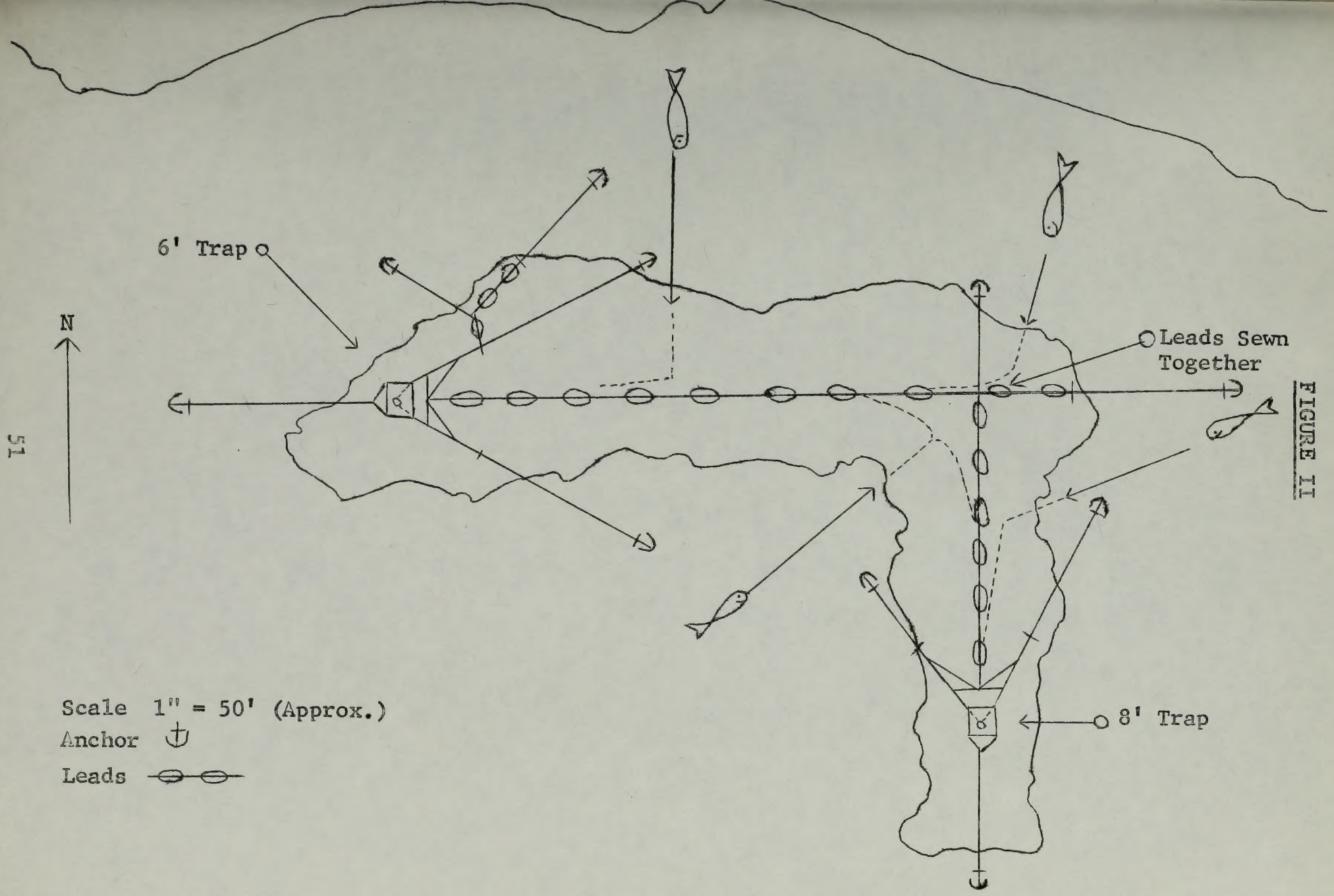
6' Trap
N
Leads Sewn
Together
8' Trap
Scale 1" = 50' (Approx.)
Anchor
Leads

FIGURE II